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Editorial Comment

Should Percutaneous Transluminal Coronary Angioplasty Catheters Be Reused?*

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There has been a dramatic increase in the use of percutaneous transluminal coronary angioplasty since its introduction in 1977 by Andreas Gruentzig. More than 430,000 procedures were performed in 1994. Although coronary angioplasty once was directed at single-vessel lesions that were proximal, discrete, noncalcified and nonoccluded, technologic advances and new methods now allow it to be used for much more challenging lesions. Its growing use and expanding indications make it one of the most important recent advances for the care of patients with coronary artery disease.

Today, one of the factors limiting its more widespread use is cost. Coronary angioplasty is approximately one-third to one-half the cost of bypass surgery, yet it remains an expensive intervention, with an average cost of more than $5,000 (1) and an average charge of about $15,000 (2). The total charge for coronary angioplasty was estimated to be more than $6 billion in 1994 (2). This amount is large enough to affect the total cost of health care and is one reason that we need to develop ways of performing coronary angioplasty less expensively.

We should expect that less expensive ways of performing the procedure can be developed. The cost of coronary angioplasty varies widely. The patient's clinical presentation and other patient characteristics, such as coexistent comorbidities, account for almost half of the observed variance, with the remainder mainly attributable to procedural variables and delays (3). One strategy for reducing the cost of coronary angioplasty is to identify which procedural variables lead to low cost ways of performing the procedure and then to disseminate this information, in the expectation that widespread use of the less costly techniques will follow.

In this issue of the Journal, Mak et al. (4) report on a study that measured the effect of catheter reuse on the overall cost of coronary angioplasty, which is one technique that has been proposed to lower cost. The reuse of medical equipment is not a new idea, and in other fields of medicine, such as nephrology and anesthesiology, equipment marketed for single use is commonly reused. In the field of cardiology, ablation catheters and pacemakers are often reused. A prospective study of ablation catheter reuse in the United States (5) showed a significant saving of $381 per procedure with catheter reuse mainly from a 400% decrease in the cost of catheters. Coronary angioplasty catheters themselves are reused routinely outside this country. The Canadian Council for Health Technologies has suggested that reuse of coronary angioplasty catheters can save $750 after three uses, and 39% of Canadian centers performing cardiac catheterization report reusing these catheters (6). Even in the United States, one survey found that 31% of hospitals reused coronary angioplasty catheters, making them the second most reused item after hemodialyzers (7).

Recently, Plante et al. (8) compared the rates of angiographic success and the rates of adverse events for one strategy that reused coronary angioplasty catheters and another strategy that used the catheters only once. They studied one center in Quebec that reused coronary angioplasty catheters and another center in Toronto that did not reuse these catheters. Plante et al. reported that when the reuse center was compared with the single-use center, more catheters were used per lesion, there was less success crossing the lesion, procedure times were longer, and there was an increased volume of contrast medium needed per procedure. There also were more adverse clinical events at the reuse center, particularly in patients with unstable angina.

In the study reported in this issue of the Journal, Mak et al. (4) combined these outcomes with costs from the Cleveland Clinic and then used theoretic models to compare the cost-effectiveness of the reuse strategy with that of the single-use strategy. They estimated that the median cost to treat a lesion with the single-use strategy was $8,800. In the reuse strategy, much of the cost saved from reusing catheters was lost treating complications. The overall cost of the reuse strategy thus depended primarily on the cost of catheters and the rate of urgent revascularization after catheter use. There was a potential saving of $480 with the reuse strategy in the best scenario, but there also was a potential increased cost of $1,075 in the worst scenario. There was little difference in cost between the two strategies in the most likely scenario.

The article by Mak et al. (4) addresses an important issue in cardiology. The authors' choice of a modeling technique was appropriate. Modeling techniques are powerful tools for estimating the trade-off between cost and quality and thus for determining whether we are getting value for money spent. Modeling techniques have proved useful in many other medical decisions (9). Modeling techniques are especially useful when more powerful research designs such as randomized, controlled trials and prospective cohort studies are not feasible, for example, when such trials are too expensive or unethical or

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when we must wait long periods for their results. In the field of cardiology, modeling techniques have been used to predict the development of coronary heart disease and to assess cardiovascular risk. Outside cardiology, modeling techniques have been used to make important policy decisions. For example, few policy statements about vaccine use are made today without reference to the results of modeling studies. Also, many of the better clinical guidelines and critical pathways that are being developed are based in part on the results of modeling studies.

Although the study by Mak et al. (4) used appropriate modeling techniques, their study was limited by its dependence on results from the study by Plante et al. (8), which were input into the model. Because the study by Plante et al. used an observational design, the single-use center and the reuse center had different types of patients, the operators used different techniques for angioplasty, and the operators may have had different levels of experience. For example, more patients at the reuse center had unstable angina, and they received more heparin and nitroglycerin infusions. Also, operators at the reuse center, but not the single-use center, used progressive dilation of lesions. Therefore, it is possible, even likely, that the worse outcomes observed in the reuse center resulted from differences other than those from catheter reuse.

This possibility has been strengthened by the recent publication of other studies that do not find the same problems with catheter reuse. Another observational study from Israel (10,11), where coronary angioplasty catheters are reused routinely, failed to find a significant difference in outcomes or adverse events when catheter reuse was compared with single use. Preliminary results from a double-blind, prospective, randomized trial comparing new and reused catheters in 1,033 procedures (12) found that both types of catheters had comparable abilities to cross lesions with similar safety records and angiographic efficacy.

Even if catheter reuse is not cost-effective for all patients, it might be cost-effective for subgroups of patients who can be identified before the procedure. This possibility was not examined by Mak et al. (4). Patients with chronic stable angina constitute one of the larger subgroups of patients who undergo coronary angioplasty. In the study by Plante et al. (8), patients with chronic stable angina had a favorable outcome irrespective of the type of catheter used. Therefore, if Mak et al. had modeled patients with chronic stable angina separately from other patients, they would not have found any additional cost from increased complications. Thus, a reuse strategy probably would have been cost-effective in patients with chronic stable angina.

These considerations raise important, unanswered questions about the article by Mak et al. Because of these questions, we believe that its conclusions should not be accepted unless they are confirmed by additional studies. We suspect, however, that additional studies will find that there is some financial benefit from the reuse of coronary angioplasty catheters, at least in patient subgroups.

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